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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Lorenzo Faraone

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12/31/2009

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EXAMINER

BRYANT, MICHAEL C

ART UNIT

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/507,015	<b>Applicant(s)</b> FARAONE ET AL.	
	<b>Examiner</b> CASEY BRYANT	<b>Art Unit</b> 2884	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 29 September 2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 26-35 and 61-63 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 26-35 and 61-63 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                       | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>9/4/09</u> .  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Status of Claims***

1. Applicant's reply, filed 9/29/2009, has been received and entered.  
Claim 35 has been amended.  
Claims 1-25 and 36-60 have been cancelled.  
New claims 62-63 have been added.  
Thus, claims 26-35 and 61-63 remain currently pending in this application.

### ***Information Disclosure Statement***

2. The Information disclosure statement (IDS) filed 9/4/2009 has been considered.

### ***Response to Arguments***

3. Applicant's arguments filed 9/29/2009 have been fully considered but they are not persuasive.
4. Regarding the rejection under 35 USC § 102(e) over Tayebati et al. (US 6,438,149), the Applicant argues the rejection fails to teach each of the limitations of the claims. Specifically, the Applicant points to the limitation reciting: "wherein the intrinsic stress is an intrinsic tensile stress adapted to be compensated by a compressive stress applied thereto such that the resultant stress in the membrane is substantially zero or sufficiently low to permit said electrostatic displacement." The Examiner respectfully disagrees with the interpretation. First, Tayebati discloses a concave DBR formed via a strain gradient imparted between a tensile strain in the silicon-nitride layer and a compressively strained dielectric layer during the fabrication process (col. 6, lines – col. 7, line 9). However, in order for the DBR to form properly, the opposing strains necessarily must balance, or the DBR will suffer mechanical failure. That is, if a strain gradient were to persist in the DBR

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structure, an acceleration would still exist causing the DBR to collapse inward or outward depending on the gradient direction. Therefore, the resultant stress in the membrane (DBR) of Tayebati after fabrication must be substantially zero. The previous argument notwithstanding, Tayebati explicitly discloses the resultant stress in the DBR sufficiently low to permit an electrostatic displacement (col. 9, lines 59-61).

Regarding claim 32, the Applicant argues that the previous action fails to reject all of the features in the claim, specifically wherein the "substrate is formed from an infrared sensitive material." However, the page 3, lines 2-3 of the Office action dated 3/30/2009 clearly state the substrate is formed of an IR sensitive material (InGasAsP).

The rejections under 35 USC § 103 over Tayebati further in view of Lipson et al. (US 6,567,209), and Carey et al. (US 6,277,696) are maintained for at least the reasons set forth above.

### ***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 26-30, 32, 34 and 61 are rejected under 35 U.S.C. 102(e) as being anticipated by Tayebati et al. (US 6,438,149).

Regarding claims 26, 32 and 61, Taywbati discloses a tunable cavity resonator (Fig. 2 & 4G) comprising: an active substrate **6** (MQW) formed of an IR

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sensitive material (InGaAsP; col. 10, lines 29-47), a moveable membrane **12** disposed parallel to the substrate **6** and suspended relative thereto at the periphery of the membrane by a support structure **37**, a pair of reflectors **10/12**, one being a first reflector layer **10** disposed in fixed relationship on the substrate **6** and the other being a second reflector layer **12** disposed on the suspended deformable membrane to form a resonant cavity, the reflectors being disposed a cavity length **8** from each other the membrane and one reflector being shaped in accordance with a prescribed membrane geometry, a pair of electrodes **28/36** juxtaposed therewith, one electrode with the one reflector and the other electrode with the other reflector (col. 11, line 29 – col. 12, line 50), wherein the moveable membrane is of substantially uniform thickness and has an intrinsic stress to permit electrostatic displacement of the membrane over distances for tuning in the infrared band using voltages applied to the electrodes commensurate with read out integrated circuit electronics associated with the resonator (col. 4, lines 20-26), and wherein the intrinsic stress of the membrane is an intrinsic tensile stress adapted to be compensated by a compressive stress applied thereto such that the resultant stress in the membrane sufficiently low to permit said electrostatic displacement (col. 6, line 56 – col. 7, line 25).

Regarding claim 27, Tayebati discloses substrate as a semiconductor system that provide access to the optical wavelengths necessary for resonance in the cavity (col. 9, lines 55-65).

Regarding claim 28, Tayebati discloses the cavity length corresponding to wavelengths in the IR region (col. 9, lines 61-65).

Regarding claim 29, Tayebati discloses the displacement of the membrane can be up to a full cavity length (col. 5, line 65 - col. 6, line 2).

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Regarding claim 30, Tayebati discloses the membranes formed of silicon nitride col. 5, lines 28-31).

Regarding claim 34, Tayebati discloses the electrodes formed separately of the reflective layers (Fig. 1).

### ***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tayebati et al. (US 6,438,149) in view of Lipson et al. (US 6,567,209).

With respect to claim 31, Tayebati discloses the support structure **37** formed of titanium-tungsten, but fails to disclose supports formed of zinc sulfide. Lipson discloses a pair of distributed Bragg reflectors (DBRs) having a support material located there between formed of ZnS. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use ZnS as support material because of its suitable optical properties in Bragg reflector cavities (col. 3, line 60 – col. 4, line 15; col. 4, line 43-col. 5, line 3).

9. Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tayebati et al. (US 6,438,149) in view of Carey et al. (US 6,277,696).

Regarding claim 33, Taybati discloses the substrate comprising InGaAsP, but does not disclose the substrate comprising MCT. Carey discloses a VSCEL system comprising an active substrate region formed of MCT (col. 4, lines 15-23). It would

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have been obvious to one of ordinary skill in the art at the time the invention was made to provide the active substrate region as MCT (HgCdTe) in the VCSEL of Taybati, as taught by Carey, since MCT is an known equivalent IR sensitive material to InGaAsP.

10. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tayebati et al. (US 6,438,149).

With respect to claim 35, Tayebati discloses the reflective layers deformable by tuning of an applied voltage, but does not specify the reflectors performing as electrodes. However, it would have been obvious to one of ordinary skill in the art to combine the electrodes and reflector layers, since it has been held that integrating parts previously known without producing any new unexpected result involves only routine skill. *In re Larson* 340 F.2d 965 144 USPQ 347 (CCPA 1965). One would have been motivated to combine the electrode functions in the reflectors in order to reduce manufacturing costs of applying additional conductive layers to the system.

11. Claim 62 and 63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tayebati et al. (US 6,438,149) in view of Sirbu et al. (US 2002/0131458 A1).

Regarding claims 62 and 63, Tayebati discloses a suspended membrane (DBR **12**) that is concave for providing a confocal cavity (col. 6, line 60 – col. 7, line 25). Sirbu teaches a DBR membrane **12a** which is substantially flat (Fig. 1; 0028). In view of the reduced fabrication complexity of the flat DBR or the preference of a planar cavity, it would have been obvious to one of ordinary skill in the art at the time of the invention to use in the device of Tayebati.

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***Conclusion***

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CASEY BRYANT whose telephone number is (571)270-1282. The examiner can normally be reached on Monday - Friday, 8am - 5pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dave Porta can be reached on (571)272-2444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David P. Porta/  
Supervisory Patent Examiner, Art  
Unit 2884

Casey Bryant  
Examiner